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ABSTRACT

This publication contains materials for three courses in Applied Math in the Applied Academics program at South Seattle Community College. It begins with the article, "Community College Applied Academics: The State of the Art?" (George B. Neff), which describes the characteristics, model, courses, and coordination activity that make up this community college applied academics program. Materials provided for each course include the following: course outline (credit, lecture, and lab hours; course description; prerequisites; learning objectives and hours of instruction) and course syllabus (course description; required materials; other policies; weekly schedules). The first course in the series introduces students to applied algebra, geometry, trigonometry, and statistics. It covers these topics: algebraic operations, exponents, roots, scientific notation, dimensional analysis, significant digits, metric system, first degree equations, plane and solid geometry, solution of right triangles, functions, graphs, descriptive statistics, and calculator fundamentals. The second course includes the following subjects: binary, octal, and hexadecimal number systems; factoring; operations with algebraic fractions; fractional and quadratic equations; systems of equations; determinants; geometry; trigonometric graphs; oblique triangles; and laws of sines and cosines. Covered in the third course are the following: radical equations, exponential and logarithmic equations, geometry, analytic geometry, inequalities, resolution of vectors, vector analysis, complex numbers, and polar coordinates. (YLB)

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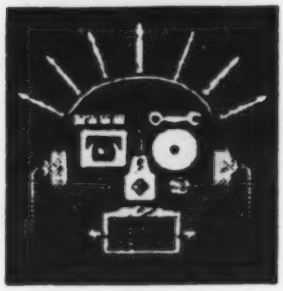

Seattle Tech Prep
Applied Academics Project

Course Materials in Applied Math

- Math 111
- Math 112
- Math 113

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Community College Applied Academics
The State of the Art?

by George B. Neff

2-20-93

The Applied Academics program at South Seattle Community College is of interest to community college educators involved in or curious about Applied Academics at the post-secondary level and it may be the state-of-the-art. This program is being developed with support from Boeing Corporation and help from CORD (Center for Occupational Research and Development, Waco Texas). CORD assisted in defining the distinguishing characteristics of Applied Academics courses used to shape South Seattle's curriculum. South Seattle Community College's courses are based on these characteristics and are part of an Applied Academics education model developed by the college for the purpose of defining and implementing quality education programs. The Applied Academics program includes courses in: Applied Math, Principles of Technology, Applied Communications, Applied Biology and Chemistry (a new area) and a subject area unique to South Seattle; Applied Humanities. These courses are coordinated with one another and with technical courses in several ways and have been validated by a team from Boeing Corporation. This article describes the characteristics, the model, the courses and the coordination activity that make up one of the most complete and interesting community college Applied Academics programs in the country.

BACKGROUND

South Seattle Community College has been blazing a trail in Applied Academics for over two years. The college is one of four institutions that make up the Seattle Community College District. The South campus is located in a heavily industrialized part of Seattle and has developed a strong area of emphasis in vocational and technical education that round out offerings in college transfer, general studies, and continuing education. The school is viewed as an innovator in vocational and technical education with nationally recognized programs in such diverse fields as Hazardous Materials Management, Food Services, Landscape and Horticulture, and Aviation related technologies. Two years ago, with financial assistance from the Boeing Corporation, the campus began to re-examine the way in which it taught academic subjects to vocational and technical students and to consider adopting the concepts, methods, and or materials of the newly evolving, high school curriculum in Applied Academics. The first two years of this effort focused on initial mastery of the concepts and techniques of Applied Academics, the development of prototype curriculum, and the implementation of initial courses. Last summer, a team of faculty from the school met to document, analyze, and improve current offerings in Applied Academics and to develop some new courses in Applied Biology and Chemistry and in Applied Humanities. The following article describes the results of their summers work.

SECTION I - Distinguishing Characteristics of Applied Academics Courses

The term "Applied Academics" has come to refer to a national standard curriculum consisting of high school courses in Applied Math, Applied Biology/Chemistry and Principles of Technology developed and sold by CORD and similar courses in Applied Communications developed and sold by AIT (Agency for Instructional Technology).

The South Seattle Community College Applied Academics courses are based on the same distinguishing characteristics as the national standard courses and in some cases utilize materials developed by and obtained from CORD or AIT but these are most definitely local products specifically designed for community college students. The development and validation of these courses necessitated the precise definition of the distinguishing characteristics of applied academics courses and the college turned to CORD for help in this critical area.

According to Leno Pedrotti, CORD's founder of Applied Math and Principles of Technology, the distinguishing characteristics of Applied Academics courses include the following:

"Applied Academics courses are competency based, utilize context based learning, integrate academic concepts into technical courses taught in a work place setting, emphasize cooperative learning and stress the use of principles, laws, formulas and rules in the real world as opposed to focusing on proofs of principles and laws, the derivation of formulas, or the evolution of rules."

The emphasis on specific competencies and on putting ideas in context was further stressed in this statement by Leno:

"Applied Academics tries to show the way in which laws, principles, formulas and proofs are used by real people, in the real world, on the job."

The distinguishing characteristics of Applied Academics are summarized as follows:

Applied Academics courses:

- *are competency based*
- *utilize context based learning*
- *integrate academic concepts into technical courses*
- *are taught in a work place setting*
- *emphasize cooperative learning*
- *stress the use of principles, laws, formulas and rules*
- *show how laws, principles, formulas and proofs are used by real people, in the real world, on the job*

The college also developed an education model that supports the implementation of the above characteristics and that defines quality education programs.

SECTION II - The Applied Academics Education Model

The education model includes an Applied Academics mission statement, goals, curriculum guidelines and tools, and instruction guidelines and tools. The purpose of the model is twofold. Not only does the model help insure and facilitate the development of an Applied Academics program that is well anchored in the distinguishing characteristics of Applied Academics, but the model also helps to explicitly define the concept of a quality education and to facilitate the development and delivery of quality education programs.

A. The Mission Statement

The Applied Academics mission statement begins to define a quality education:

"Our mission is to assist in the preparation of persons able to enjoy and discharge the rights, privileges, and responsibilities of citizens in a free society including the rights, privileges and duties of citizenship, vocation, family membership, community membership, and participation in leisure activities."

This mission is consistent with the Presidents education goals, and the SCANS (Secretary's Commission on Achieving Necessary Skills) recommendations, and generally accepted ideas in the tradition of a liberal education as discussed by John Henry Newman in his essays on "The Idea of a University" and the report of the Harvard Committee on a "General Education in a Free Society". Each of these works recognizes that quality education not only prepares good workers but also good family members, community members, and good citizens. The thrust of the current national standard Applied Academics curriculum largely ignores preparation for roles beyond the work place, which is a potentially serious quality problem. South Seattle's Applied Academics program, on the other hand, includes courses in Applied Humanities specifically designed to address preparation for roles not only in but also beyond the work place. The South Seattle Applied Academics mission statement helps focus emphasis on all the roles of a citizen in a free society, a key issue in program quality.

B. The Goals of the Applied Academics Program

The goals of the Applied Academics program are as follows:

"The goals of the South Seattle Community College Applied Academics program are to assist students in leading happy and productive lives as citizens in a free society by providing them with citizenship skills, general work place skills, and specific academic, technical, and vocational skills."

The three level approach to Applied Academics goals (Citizenship, General Work place, and Subject Specific Goals) is unique to South Seattle Community College as far as can be determined but this approach was found to be necessary and useful.

Most skills or competency models (the two terms are used interchangeably in this paper) currently under development try to lump two or more of these categories together and as a result are criticized alternately for over or under emphasis on citizenship vs. work place skills or general vs. specific skills. The three level approach makes the selection of a desirable mix among these elements much easier. The South Seattle goals are defined in more detail in the following section.

Providing Citizenship Skills - Goal 1

Citizenship skills include a knowledge of the rights and responsibilities of citizens in a free society, critical thinking skills, an understanding of work place ethics, knowledge of applied esthetics (i.e. industrial design, human factors engineering etc.), and expertise in applied history (i.e. the techniques of the historian applied to such things as the life cycles of businesses, products, materials and technologies). Esthetics and history are included as citizenship skills because they encourage the consideration of values.

Providing "Citizenship Skills" helps insure that the Applied Academics program turns out not only good workers but also good and complete citizens, a key element is South Seattle's definition of a quality education.

Providing General Work Place Skills - Goal 2

The project did not develop a new list of general work place skills but adopted those skills defined in the SCANS report including five work place competencies and three foundation skills. The SCANS skills seemed adequate for the program and similar enough to the other national general work place competency models being developed to warrant adoption at the time although the college plans to revisit this subject in 1993.

Providing students with "General Work Place Skills" insures that the Applied Academics program and other technical programs turn out individuals not only expert in some vocational or technical facts, but individuals capable of sharing existing facts, acquiring new facts as these become available, applying them in the work place, working effectively with others, assimilating technical change and other job independent, work place skills.

Providing Specific Academic, Vocational, and Technical Skills - Goal 3

Specific academic, vocational and technical skills include academic subject specific, and occupation specific skills that vary with each course of instruction. These skills are developed and documented on a course by course basis.

Providing "Specific Academic, Vocational, and Technical Skills" insure that students receive sufficient specific training to qualify for initial employment and to practice general concepts, theories, laws and proofs.

The Applied Academics goals are based on the mission statement and add specificity to it. The mission statement and goals help insure implementation of the principles of Applied Academics and the delivery of quality education programs but are not complete in and of themselves. What is lacking is a way to insure the incorporation of these concepts into the everyday life of the college. The following Curriculum and Instruction guidelines and tools were adopted or developed for this purpose.

C. Curriculum Guidelines and Tools

The following guidelines assume simple definitions of the terms curriculum and instruction. Curriculum is defined as "what you teach", instruction is defined as "how you teach it".

Curriculum elements in the Applied academics model include a program course mix guideline, a course skills mix guideline, and a standard course outline tool.

Guideline 1 - Course Mix

This guideline insures that technical programs prepare students who are good workers but also good citizens.

"All programs of technical instruction should provide students with a suitable mix of courses in citizenship skills, general work place skills and specific academic, vocational and technical skills."

Guideline 2 - Skills Mix

The second curriculum guideline insures the implementation of the Applied Academics principles of context based learning in general and the principle of the integration of academic materials into technical courses in particular.

"Academic concepts should not only be taught in separate academic courses but should also be integrated into all technical courses."

The Standard Course Outline

The model includes a curriculum tool used to measure the mix of skills included in given course or program, the standard course outline. The standard course outline supports the analysis of program and course level skills mix by spreading total course hours among those citizenship skills, general work place skills and specific academic, vocational and technical skills included in the course.

The hours of instruction identified in each course outline may be added together to evaluate the overall mix of instruction provided in any existing or proposed program of study. This approach provides a general control over course and program mix.

D. Instruction Guidelines and Tools

Instruction elements included in the model are a Context Based Instruction Guideline, a Cooperative Learning Guideline, a Utility Guideline and a Course Syllabus Tool. These elements implement the distinguishing characteristics of Applied Academics.

Guideline 1 - Context Based Instruction

Applied Academics courses, more than anything else, teach abstract ideas by putting them in "context".

"Applied Academics courses should be taught in the context of real world settings including the work place, home, and community."

Guideline 2 - Cooperative Learning Techniques

Today's work place puts heavy emphasis on team work. This emphasis is reflected in the Applied Academics program.

"Applied Academics courses should emphasize cooperative learning as a primary instruction model where appropriate."

The college also emphasizes capstone team projects in year two of technical degree programs.

Guideline 3 - Utility

The utility guideline is a key in transforming traditional academic courses into Applied Academics courses.

"Applied Academics courses should stress the use of principles, laws, formulas, and rules in the real world as opposed to the proof of principles and laws, the derivation of formulas, or the evolution of rules."

Guideline 4 - Competency Based Instruction

Competencies or Skills (the terms are used interchangeably in this document), are a key in tieing together instruction between high school and the community college or between related courses in a series of courses.

"Applied Academics courses will provide instruction in clearly defined Citizenship Skills, General Work Place Skills, and Subject Specific Skills."

The Standard Course Syllabus

The above instruction guidelines are reflected in the standard course syllabus. The standard syllabus encourages instructors to consider and to describe the implementation of the above instruction guidelines when creating or selecting teaching methods for Applied Academics courses.

The above Applied Academics education model, including the mission statement, goals, curriculum guidelines and tools and instruction guidelines and tools support the development and implementation of quality Applied Academics programs at South Seattle Community College.

SECTION III - Impacts of the Model on Instructors

Instructors have had a variety of feelings and experiences in attempting to deal with the subject of applied academics and to understand and use the concepts and tools described in this article. Some general patterns appear to be as follows.

In the initial phases of Applied Academics some of the teachers trained in classic academic disciplines felt suspicious about the heavy work place emphasis of the program and doubtful about course and program quality and intent.

In an effort to deal with these initial concerns academic teachers were drawn together with technical faculty and representative of the business community for twice monthly meetings during the summer of 1992.

This project known as the Applied Academics Task Force operated with funding support from the Boeing Corporation and had as its goal the definition of the Education Model described in this article, the development of the Applied Humanities and Applied Biology and Chemistry courses and the analysis and documentation of the college's existing courses in Applied Math, Principles of Technology, and Applied Communications.

The project provided academic and technical teachers with an opportunity to get together outside the press of the academic year, to develop some additional rapport and empathy and to take control, in a sense, of what had been a potentially troublesome topic. This process in and of itself helped teachers feel more in control of things.

The isolation of the distinguishing characteristics of Applied Academics and the reduction of these concepts to some practical guidelines and tools for course development, curriculum and instruction also helped individuals in their understanding of and comfort with this subject.

A related pattern also emerged. It became clear that every teacher involved in the project was already teaching Citizenship Skills, General Work Place Skills and Specific Skills in every course without being asked to do so and, in some cases, without really focusing on this fact. Once the three part skills structure (Citizenship Skills, General Work place Skills and Specific Skills) was defined the teachers quickly saw the pattern in their courses. The fact that all the teachers, academic and technical, shared an interest in all three skills areas helped bond the group.

The structure also was a challenge to the instructors when it came to allocating course hours to skills. It was often the case that more then one kind of skill was taught in a single course activity, for instance, presenting a project to the class could involve not only speaking skills but also an understanding of technical facts related to the project, thinking, speaking, listening, and teamwork skills. These structural challenges were ultimately met with some creative solutions by the team members.

In summary, instructors finished the project with a better appreciation of one another and a new confidence in their ability to define and deliver Applied Academics courses.

SECTION IV - Courses in the Applied Academics Program

The Applied Academics program at South Seattle Community College includes three courses in Applied Math, three in Principles of Technology, four in Applied Communications, four in Applied Biology/Chemistry, and four in Applied Humanities.

The courses in Applied Humanities are unique to South Seattle and include Applied Civics, Applied Philosophy, Applied History and Applied Art. Some detail regarding these courses is provided below because they are unique to South Seattle

A feel for the content of the program is provided in the following course highlights:

Applied Math

Applied Math is currently a three course series. The first course in the series introduces students to applied algebra, geometry, trigonometry, and statistics. This course includes algebraic operations, exponents, roots, scientific notation, dimensional analysis, significant digits, the metric system, first degree equations, plane and solid geometry, solution of right triangles, functions, graphs, descriptive statistics, calculator fundamentals, and applications. This course is designed to be compatible with the modules used in CORD's Applied Mathematics curriculum.

Principles of Technology

The first course is a blend of technology principles with lab practices that involve Mechanical, Fluid, Electrical, and Thermal Systems that are used by technicians in their everyday work.

The second course is a continuation of applied physics with accentuation on rate, energy, power, momentum, resistance and force transformers.

The third course is a continuation of applied physics with accentuation on energy converters, transducers, vibrations and waves, time constants, radiation, and optical systems.

Applied Communications

The first course is designed for technical students and serves as an introduction to communication skills in the work place. Students assess, practice, and improve their oral and written skills in a variety of business formats. This course is coordinated with a computer application course to encourage integration of writing and computer skills.

The second course involves the preparation of a detailed career plan by each student and results in the production of a document in a formal business report format with front matter, a body and complete back matter. This course interfaces with the schools counseling and career services functions, uses skills and careers data banks and library business reference functions, and involves extensive use of the computer.

The third course is coordinated with the students technical program and focuses on communications issues related to second year technical capstone projects. During the year students develop project plans, status reports, research plans, conduct research, do project reports and make speeches. At the end of the year the technical projects, reports and speeches are presented to business advisors and prospective employers in formal end of the year meetings.

Applied Biology and Chemistry

This is a four course series. In these courses biology and chemistry are treated as a unified science.

The first course includes the sources, uses, and problems relating to natural resources and the properties, uses, quality and cycles of water, air and other gases. This course is designed to be compatible with the modules used in CORD's Applied Biology/Chemistry curriculum.

The second course includes components of the continuity of life including genetics, reproduction, and evolution. Food sources and effects of diet on nutrition and disease transmission, prevention, and treatment in plants and animals are also discussed.

The third course included photosynthesis and the role of nutrients in plant growth and reproduction; animal anatomy and physiology of life processes; and types, benefits and hazards of microorganisms to humans as well as biotechnology applications of microorganisms.

The fourth course includes the sources, properties, and uses of synthetic materials; control of home, community and industrial waste, and waste management; and animals and plants sharing space and resources in a community.

Critical Thinking and Ethics in the Work Place (Applied Philosophy)

Critical Thinking and Ethics in the Work place is an introduction to critical thinking, logic and scientific reasoning with applications to other courses, everyday life and work. It is been created with technical education students in mind; whenever possible topics are related directly to the programs of study and future careers of technical education students.

Responsibilities and Rights of Citizenship (Applied Civics)

This course examines individual rights and responsibilities in a free society in the practical context of and individual's roles as a citizen and resident of various levels of government, family member and employee or employer. The course distinguishes between legally enforceable rights and obligations and those rights and responsibilities that are considered essential to a free society. The course assists students in thinking clearly about these issues and adds the dimension of values to the process of this critical thinking.

Lifecycles of Business, Products, and Technologies (Applied History)

This course enables students to use history: its content, analytical process, research methods, analytical methods and writing techniques to anticipate, understand and benefit from changing technology. The course provides the student with insight into the nature of the life cycles of products, materials and processes using the techniques of research, analysis, and writing of history.

Industrial Design And Human Factors (Applied Art)

This course assists the student in developing an esthetics approach to technology and the world of work. The concepts of quality, beauty, good design, and a good work environment are explored from a variety of viewpoints including the philosophical, multi-cultural, psychological, economic, and technological. The course considers esthetics values, the psychology of perception, social values, economics and design, production, materials, and vocational applications.

SECTION V -Inserting New Applied Academics Courses into Established Programs

An interesting set of problems occur when considering how to insert new courses in Applied Academics into existing technical programs. The first fact usually associated with this process is that there is never any extra time for additional courses. The inevitable consequence of this is that new courses must be used as substitutes for existing courses. All the courses described above were developed as substitutes for existing traditional academic courses, some of which were required some electives. But course substitution can be a real pandora's box.

Usually, instructors of current academic courses are schooled in traditional academics and are not hired to be experts in the nuances of the work place. These instructors sometimes see work place preparation as something separate from academics and sometimes beneath traditional academics and may or may not be inclined toward change in any event. Even in the best of cases, where academic instructors are expert in the ways of the work place, enthusiastic about the mission of work place preparation and natural innovators they may not be conversant with the distinguishing characteristics of Applied Academics and the underlying methods of Applied Academics and will therefore be unable to develop and deliver suitable applied courses.

The solution to these problems are not easy to implement but they are simple conceptually. The first decision to make is "can the instructor of an existing traditional academic course develop and deliver a substitute Applied Academics course?". If the answer is not a resounding unqualified yes, then the best approach is recruiting. The second decision to make, if the answer is yes, is "what kind of help will that instructor need in developing and implementing the course?". Some answers to this second question from South Seattle's experience are:

- Provide compensated time outside the press of daily affairs for training and course development.
- Assign instructors to work in teams that include academic instructors, technical instructors and business people.
- Discuss underlying education values.
- Provide an Education Model or some other form of structure within which course development occurs and that insures conformance to agreed upon concepts and values.

The processes of developing Applied Academics courses and of inserting them into existing technical programs present some real challenges but success is possible given the right approach.

SECTION VI - The Coordination of Applied Academics Courses

The distinguishing characteristics of Applied Academics courses suggest that much can be gained from demonstrating the application of academic concepts by relating the concepts to technical subjects.

South Seattle's experience in this area began with the development and implementation of two coordinated courses, an Applied Academics course in Communications, and a course in Computer Applications. In these coordinated courses, students were taught concepts in written and oral communications, and research in the Communications class and were then given a chance to apply these concepts using computer tools (i.e. word processors, presentation graphics and aides, CD-ROM and on-line data bases). This effort met with great success and has led to the coordination of new Applied Communications courses with campus career services and with second year, capstone technical projects.

One of the difficulties in developing and implementing such coordinated courses is the extra time it takes instructors to develop the course and coordinate delivery. The college is fortunate in being able to use faculty development funds to provide stipends to two instructors each quarter, to develop and deliver one new set of coordinated courses.

SECTION VII - Business Validation

The South Seattle Community College Applied Academics program is being validated by the Boeing Corporation as part of their ongoing support to the project. A team of Boeing executives representing corporate business practices, pre-employment screening, and management development, were asked to evaluate all the Applied Academics courses at a high level and to evaluate the Applied Humanities courses in detail. The Boeing team found that the overall Applied Academics program design was on target and that the proposed courses in Applied Humanities were in some cases necessary and in some cases desirable. The Boeing team also proposed some changes on a course by course basis that are being incorporated in the design.

SECTION VIII - Summary

South Seattle's Applied Academics program is still evolving and is by no means complete at this time but the existence of a formal Applied Academics Education Model coupled with community college courses in the newer areas of Applied Communications, Applied Biology and Chemistry and Applied Humanities make it one of the most complete and innovative programs of its type, it may be the state-of-the-art.

Some major issues in Applied Academics have yet to be explored by the college and are targeted for future inquiry. On question is "Do employers really want students who think for themselves and who have highly developed ethical sensitivities?". Another is "Are students who have spent time mastering citizenship competencies and general work place competencies at a disadvantage in competing for entry point jobs with students who do not have these skills but have more occupation specific skills. The question will be explored with the help of a team of Boeing Executives in the coming months.

Another question is the relationship of Applied Academics to English-as-a-Second Language (ESL), and Adult Basic Education (ABE) programs. The Applied Academics courses are required courses for students in a wide range of technical programs. Students taking courses in ESL, ABE might benefit from the principles of teaching in applied context, making it easier for special population of students to access college-level education.

These are but a few more interesting issues to be explored in the further development and refinement of Applied Academics at South Seattle Community College in the future.

COURSE OUTLINE

DEPARTMENT:	Technical Education Division
CURRICULUM:	Mathematics
COURSE TITLE:	Applied Mathematics I
COURSE NUMBER:	MAT 111
COLLEGE TRANSFER:	No
TYPE OF COURSE:	Allied Supporting & Vocational General Education
CREDIT HOURS:	5

HOURS:

Lecture Hours	53
Lab Hours	00
Homework Hours	53
Other Hours	—
Total Hours	106

CLASS SIZE:	35
COURSE DESCRIPTION:	Introduction to applied algebra, geometry, trigonometry, and statistics. Includes algebraic operations, exponents, roots, scientific notation, dimensional analysis, significant digits, metric system, first degree equations, plane and solid geometry, solution of right triangles, functions, graphs, descriptive statistics, calculator fundamentals, and applications. This course is designed to be compatible with the modules used in CORD's Applied Mathematics curriculum.
COURSE HISTORY:	Originally developed by Don Howard, in 1991.
PREREQUISITES:	Score of at least 36 on the numerical skills section of ASSET or instructor's permission.

COURSE OUTLINE (Cont.)

LEARNING OBJECTIVES:	HOURS OF INSTRUCTION
A. CITIZENSHIP KNOW-HOW:	
1. RIGHTS AND RESPONSIBILITIES	___
2. CRITICAL THINKING (SEE FOUNDATION SKILLS: b. Thinking Skills)	___
3. WORKPLACE ETHICS	___
4. APPLIED ESTHETICS	___
5. LIFECYCLES	___
B. WORKPLACE KNOW-HOW:	
1. FIVE WORKPLACE COMPETENCIES	
a. Resources:	
1) Time	x
2) Money	___
3) Material and Facilities	___
4) Human Resources	___
b. Interpersonal:	
1) Participates as Member of a Team	x
2) Teaches Others New Skills	___
3) Serves Clients/Customers	___
4) Exercises Leadership	___
5) Negotiates	___
6) Works with Diversity	x
c. Uses Information:	
1) Acquires and Evaluates Information	x
2) Organizes and Maintains Information	x
3) Interprets and Communicates Information	x
4) Uses Computers to Process Information	x
d. Systems:	
1) Understands Systems	___
2) Monitors and Corrects Performance	___
3) Improves or Designs Systems	___
e. Technology:	
1) Selects Technology	x
2) Applies Technology to Task	x
3) Maintains and Troubleshoots Equipment	___
2. THREE FOUNDATION SKILLS	
a. Basic Skills:	
1) Reading	x
2) Writing	x
3) Arithmetic/Mathematics	106
4) Listening	x
5) Speaking	x

COURSE OUTLINE (Cont.)

LEARNING OBJECTIVES:	HOURS OF INSTRUCTION
b. Thinking Skills:	
1) Creative Thinking	___
2) Decision Making	X
3) Problem Solving	X
4) Seeing Things in the Mind's Eye	___
5) Knowing How to Learn	X
6) Reasoning	X
c. Personal Qualities:	
1) Responsibility	X
2) Self-Esteem	X
3) Sociability	X
4) Self-Management	X
5) Integrity/Honesty	X

C. MATHEMATICS COMPETENCIES:

NUMERICAL CONCEPTS

1. State whether a given number is natural, whole, an integer, rational, irrational, real, or imaginary.
2. Read and write decimal numbers that range from trillion to trillionth.
3. State whether a given number is approximate or exact.
4. Determine the number of significant digits contained in a given approximate number.
5. Determine the accuracy of an approximate number.
6. Determine the precision of an approximate number.
7. Read and write measurements to show tolerance.
8. Round a number to a given precision.
9. Truncate a number to a given precision.
10. Use symbols of equality, inequality, and approximate equality.
11. Add, subtract, multiply, and divide real (signed) numbers.
12. Compute powers, roots, absolute values, and reciprocals of real numbers.
13. Convert numbers from decimal form to scientific notation, and vice versa.
14. Convert denominate numbers within the metric system (such as, centimeters to kilometers).
15. Convert the English system of measurement into the metric system, and vice versa.
16. Solve percentage problems.

COURSE OUTLINE (Cont.)

ALGEBRA

17. Add, subtract, multiply, and divide algebraic expressions.
18. Solve linear (first degree) equations in one variable.
19. Substitute real numbers into formulas and evaluate them.
20. Solve literal equations and formulas.
21. Solve problems using ratios and proportions.
22. Use functional notation to evaluate functions.
23. Plot points and graph linear equations in a rectangular coordinate system.
24. Solve verbal problems (including electronics, construction and manufacturing design, motion, force, mixture, and finance problems) that translate into linear equations.

GEOMETRY

25. Use a protractor to measure angles.
26. Divide a degree into minutes and seconds and then convert them to decimal degree notation, and vice versa.
27. Solve problems that involve the perimeter (or circumference) and area of plane geometrical figures (such as triangles, squares, rectangles, parallelograms, trapezoids, and circles).
28. Solve problems that involve the surface area and volume of solid geometrical figures (such as cubes, rectangular solids, cylinders, cones, pyramids, and spheres).
29. Convert among degrees, radians, and revolutions.

TRIGONOMETRY

30. Use the Pythagorean Theorem to find the missing side of a right triangle when two sides are known.
31. Define and evaluate the six trigonometric functions of an acute angle contained in a right triangle.
32. Solve problems that involve right triangles using trigonometry.

STATISTICS

33. Organize raw data into ascending and descending order.
34. Organize data into frequency distributions, histograms, and polygons.
35. Construct a line, bar, or pie graph using data.
36. Calculate the mean, median, mode, variance, standard deviation, and range from data.

SCIENTIFIC CALCULATOR

37. Use a hand-held scientific calculator to compute numerical solutions to MAT 111 problems. (Additionally, instruction will be presented on the use of a hand-held programmable scientific calculator with graphing capabilities.)

Submitted by: _____ Date: _____

Approved by: _____ Date: _____

COURSE SYLLABUS

Quarter:	Fall 1992
Course Number:	MAT 111
Course Title:	Applied Mathematics I
Section Number:	01
Instructor:	Don Howard
Office Location:	RS 048
Office Hours:	Arrange (9:00 a.m. to 4:00 p.m.)
Office Phone Number:	764-5376
Room Number:	RS 080
Course Description:	Introduction to applied algebra, geometry, trigonometry, and statistics. Includes algebraic operations, exponents, roots, scientific notation, dimensional analysis, significant digits, metric system, first degree equations, plane and solid geometry, solution of right triangles, functions, graphs, descriptive statistics, calculator fundamentals, and applications. This course is designed to be compatible with the modules used in CORD's Applied Mathematics curriculum.
Required Materials:	Technical Mathematics Second Edition Paul Calter "How to Study Technical Mathematics" Paul Dudenhefer Scientific calculator, compass, protractor, straight edge, and graph paper
Optional Materials:	Student Solution Manual John Knox Student Problem Manual Michael Calter

COURSE SYLLABUS (Cont.)

Optional Materials:

"IBM Software Tools: Computer Aid to Technical Mathematics with Calculus"
Albert Parish, Jr. and Nathan Niles

Video to accompany Technical Mathematics
Paul Calter

CORD's Applied Mathematics
Curriculum Materials

Course Schedule:

See Weekly Schedule below

Evaluation Policy:

You will be evaluated on an applied mathematics project and your three highest examinations. To receive credit for the project, it must be submitted no later than 8:00 a.m., December 4, 1992. Late projects cannot be submitted. The dates on which examinations will be given are as follows:

Examination 1	October 23
Examination 2	November 20
Examination 3	December 10
Final Examination	December 14

If you are absent on an examination date, you will not be permitted to makeup the examination without written correspondence from a licensed health care professional.

Grading Procedure:

Twenty-five percent (25%) of the grade will be based on the applied mathematics project, and twenty-five percent (25%) will be based on each of the three highest examinations.

COURSE SYLLABUS (Cont.)

Conformance to Guidelines:

"All Applied Academics courses will be taught in the context of real world settings including the workplace, home, and community."

The Applied Mathematics I course will be taught using applied problems from the workplace. Students will be required to solve electronics, motion, force, mixture, and finance problems that translate into linear equations. Additionally, students must solve construction and manufacturing design problems that are related to plane and solid geometrical figures as well as right triangle trigonometric relationships. Furthermore, students will use statistical techniques to organize raw technical data and analyze it based on computing its mean, median, mode, variance, standard deviation, and range. Also, students will be required to present technical data visually by constructing a line, bar, and pie graph. Finally, students must interpret technical data that is presented as a line, bar, or pie graph.

"All Applied Academics courses will emphasize cooperative learning as a primary instruction model."

Since students are expected to learn mathematics both in and out of class, the instructional model of the Applied Mathematics I course will promote cooperative learning in and out of class.

During classroom instruction, the instructor will not use the traditional full session, one-way lecture model where the instructor does most, if not all, of the speaking. Rather, the instructor will use approximately one-third of each session to present mathematical terms, notation, axioms, theorems, algorithms, and applications in the lecture format.

The instructor will use the majority of the classroom instructional time, about two-thirds of each session, to facilitate a group discussion where each student will be encouraged to participate actively and peer learning will result.

Additionally, the instructor will provide daily learning activities out of class. The instructor will explain the benefits of cooperative learning. Students will be encouraged to work in groups to complete the daily assignments.

Finally, to promote an overall learning climate, in and out of class, based on cooperation, rather than competition, the instructor will use a criterion-referenced evaluation procedure. This procedure emphasizes mastery of course competencies, instead of norm-referenced evaluation procedures based on peer competition and the curve.

COURSE SYLLABUS (Cont.)

"All Applied Academics courses will stress the use of principles, laws, formulas and rules in the real world as opposed to focusing on proofs of principles and laws, the derivation of formulas, or the evolution of rules."

The Applied Mathematics I course will use principles, laws, formulas, and rules to solve technical problems. For example, rather than require students to prove or derive the Pythagorean theorem, quadratic formula, or the law of sines, students will be required to use (apply) them to solve technical problems.

"All Applied Academics courses will be competency-based."

The Applied Mathematics I course is based on thirty-seven (37) competencies. Each competency states what the student must do to demonstrate the acquisition of knowledge, skills, or attitudes. The attached weekly schedule reflects the approximate week in which the successful student will acquire course competencies.

Submitted by: _____ Date: _____

Approved by: _____ Date: _____

WEEKLY SCHEDULE - MAT 111

Week 1

1. State whether a given number is natural, whole, an integer, rational, irrational, real, or imaginary.
2. State whether a given number is approximate or exact.
3. Determine the number of significant digits contained in a given approximate number.
4. Determine the accuracy of an approximate number.
5. Determine the precision of an approximate number.
6. Round a number to a given precision.
7. Truncate a number to a given precision.
8. Use symbols of equality, inequality, and approximate equality.
9. Add, subtract, multiply, and divide real (signed) numbers.

Week 2

10. Read and write measurements to show tolerance.
11. Compute powers, roots, absolute values, and reciprocals of real numbers.
12. Convert numbers from decimal form to scientific notation, and vice versa.
13. Substitute real numbers into formulas and evaluate them.
14. Use a hand-held scientific calculator.

Week 3

15. Read and write decimal numbers that range from trillion to trillionth.
16. Convert denominate numbers within the metric system (such as, centimeters to kilometers).
17. Convert the English system of measurement into the metric system, and vice versa.

Week 4

18. Add, subtract, multiply, and divide algebraic expressions.

Week 5

19. Solve linear (first degree) equations in one variable.
20. Solve literal equations and formulas.
21. Solve percentage problems.

Week 6

22. Solve verbal problems (including electronics, construction and manufacturing design, motion, force, mixture, and finance problems) that translate into linear equations.
23. Solve problems using ratios and proportions.

Week 7

24. Use a protractor to measure angles.
25. Divide a degree into minutes and seconds and then convert them to decimal degree notation, and vice versa.
26. Solve problems that involve the perimeter (or circumference) and area of plane geometrical figures (such as triangles, squares, rectangles, parallelograms, trapezoids, and circles).
27. Convert among degrees, radians, and revolutions.
28. Use the Pythagorean Theorem to find the missing side of a right triangle when two sides are known.

Week 8

29. Solve problems that involve the surface area and volume of solid geometrical figures (such as cubes, rectangular solids, cylinders, cones, pyramids, and spheres).
30. Define and evaluate the six trigonometric functions of an acute angle contained in a right triangle.

WEEKLY SCHEDULE - MAT 111 (Cont.)

Week 9

31. Use functional notation to evaluate functions.
32. Plot points and graph linear equations in a rectangular coordinate system.
33. Solve problems that involve right triangles using trigonometry.

Week 10 & 11

34. Organize raw data into ascending and descending order.
35. Organize data into frequency distributions, histograms, and polygons.
36. Construct a line, bar, or pie graph using data.
37. Calculate the mean, median, mode, variance, standard deviation, and range from data.

COURSE OUTLI NE

DEPARTMENT:	Technical Education Division
CURRICULUM:	Mathematics
COURSE TITLE:	Applied Mathematics II
COURSE NUMBER:	MAT 112
COLLEGE TRANSFER:	No
TYPE OF COURSE:	Allied Supporting & Vocational General Education
CREDIT HOURS:	5

HOURS:

Lecture Hours	53
Lab Hours	00
Homework Hours	53
Other Hours	____
Total Hours	106

CLASS SIZE: 35

COURSE DESCRIPTION: Continuation of MAT 111; includes binary,octal, and hexadecimal number systems, factoring, operations with algebraic fractions, fractional and quadratic equations, systems of equations, determinants, geometry, trigonometric graphs, oblique triangles, laws of sines and cosines, calculator fundamentals, and applications.

COURSE HISTORY: Originally developed by Don Howard, in 1991.

PREREQUISITES: MAT 111 or instructor's permission.

LEARNING OBJECTIVES: **HOURS OF INSTRUCTION**

A. CITIZENSHIP KNOW-HOW:

1. RIGHTS AND RESPONSIBILITIES ___
2. CRITICAL THINKING (SEE FOUNDATION SKILLS: b. Thinking Skills) ___
3. WORKPLACE ETHICS ___
4. APPLIED ESTHETICS ___
5. LIFECYCLES ___

COURSE OUTLINE (Cont.)

LEARNING OBJECTIVES:	HOURS OF INSTRUCTION
B. WORKPLACE KNOW-HOW:	
1. FIVE WORKPLACE COMPETENCIES	
a. Resources:	
1) Time	x
2) Money	___
3) Material and Facilities	___
4) Human Resources	___
b. Interpersonal:	
1) Participates as Member of a Team	x
2) Teaches Others New Skills	___
3) Serves Clients/Customers	___
4) Exercises Leadership	___
5) Negotiates	___
6) Works with Diversity	x
c. Uses Information:	
1) Acquires and Evaluates Information	x
2) Organizes and Maintains Information	x
3) Interprets and Communicates Information	x
4) Uses Computers to Process Information	x
d. Systems:	
1) Understands Systems	___
2) Monitors and Corrects Performance	___
3) Improves or Designs Systems	___
e. Technology:	
1) Selects Technology	x
2) Applies Technology to Task	x
3) Maintains and Troubleshoots Equipment	___

COURSE OUTLINE (Cont.)

LEARNING OBJECTIVES:	HOURS OF INSTRUCTION
2. THREE FOUNDATION SKILLS	
a. Basic Skills:	
1) Reading	x
2) Writing	x
3) Arithmetic/Mathematics	106
4) Listening	x
5) Speaking	x
b. Thinking Skills:	
1) Creative Thinking	—
2) Decision Making	x
3) Problem Solving	x
4) Seeing Things in the Mind's Eye	—
5) Knowing How to Learn	x
6) Reasoning	x
c. Personal Qualities:	
1) Responsibility	x
2) Self-Esteem	x
3) Sociability	x
4) Self-Management	x
5) Integrity/Honesty	x

C. MATHEMATICS COMPETENCIES:

NUMERICAL CONCEPTS

1. Convert among binary, octal, decimal, and hexadecimal numbers.

ALGEBRA

2. Factor completely multinomials, including difference of two squares and trinomials.
3. Reduce algebraic fractions to lowest terms.
4. Add, subtract, multiply, and divide algebraic fractions.
5. Solve fractional (rational) equations.
6. Solve verbal problems that translate into fractional equations, such as rate problems involving motion, work, fluid flow, energy flow, electronics, and finance problems.
7. Solve systems of linear equations in two unknowns using the following methods:
   a. addition method
   b. substitution method
   c. graphical method
   d. determinant method (Cramer's Rule)
8. Solve systems of linear equations in three unknowns using determinants.

COURSE OUTLINE (Cont.)

9. Solve verbal problems (including electronics, construction and manufacturing design, motion, force, mixture, work, fluid flow, and energy flow problems) that translate into linear equations and systems of linear equations.
10. Solve quadratic equations by factoring.
11. Solve quadratic equations using the quadratic formula.
12. Solve verbal problems that translate into quadratic equations, such as motion, manufacturing and construction design, electronics, work, and force problems.

GEOMETRY

13. Solve problems that involve the perimeter (or circumference) and area of plane geometrical figures (such as triangles, squares, rectangles, parallelograms, trapezoids, and circles).
14. Solve problems that involve the surface area and volume of solid geometrical figures (such as cubes, rectangular solids, cylinders, cones, pyramids, and spheres).
15. Convert among degrees, radians, and revolutions.
16. Compute the area of a circle's sector and segment.
17. Compute the arc length, radius, or central angle when two of the other quantities are known.

TRIGONOMETRY

18. Define and evaluate the six trigonometric functions of any angle.
19. Find the appropriate angle(s) (0 through 360 degrees) when the trigonometric value is known.
20. Find the unknown sides and/or angles of oblique triangles using the law of sines and law of cosines, as appropriate.
21. Find the amplitude, period, and phase shift for sine and cosine functions.
22. Graph the sine, cosine, and tangent functions.
23. Graph alternating current using the sine function.

SCIENTIFIC CALCULATOR

24. Use a hand-held scientific calculator to compute numerical solutions to MAT 112 problems. (Additionally, instruction will be presented on the use of a hand-held programmable scientific calculator with graphing capabilities.)

Submitted by: _____ Date: _____

Approved by: _____ Date: _____

COURSE SYLLABUS

Quarter:	Winter 1993
Course Number:	MAT 112
Course Title:	Applied Mathematics II
Section Number:	01
Instructor:	Don Howard
Office Location:	RS 048
Office Hours:	Arrange (9:00 a.m. to 4:00 p.m.)
Office Phone Number:	764-5376
Room Number:	RS 080
Course Description:	Continuation of MAT 111; includes binary, octal, and hexadecimal number systems, factoring, operations with algebraic fractions, fractional and quadratic equations, systems of equations, determinants, geometry, trigonometric graphs, oblique triangles, laws of sines and cosines, calculator fundamentals, and applications.
Required Materials:	Technical Mathematics Second Edition Paul Calter "How to Study Technical Mathematics" Paul Dudenhefer Scientific calculator, compass, protractor, straight edge, and graph paper
Optional Materials:	Student Solution Manual John Knox Student Problem Manual Michael Calter

COURSE SYLLABUS (Cont.)

Optional Materials: "IBM Software Tools: Computer Aid to Technical Mathematics with Calculus"
Albert Parish, Jr. and Nathan Niles

Video to accompany Technical Mathematics
Paul Calter

CORD's Applied Mathematics
Curriculum Materials

Course Schedule: See Weekly Schedule below

Evaluation Policy: You will be evaluated on an applied mathematics project and your three highest examinations. To receive credit for the project, it must be submitted no later than 8:00 a.m., March 00, 1993. Late projects cannot be submitted. The dates on which examinations will be given are as follows:

Examination 1	January 00
Examination 2	February 00
Examination 3	March 00
Final Examination	March 00

If you are absent on an examination date, you will **not** be permitted to makeup the examination without written correspondence from a licensed health care professional.

Grading Procedure: Twenty-five percent (25%) of the grade will be based on the applied mathematics project, and twenty-five percent (25%) will be based on each of the three highest examinations.

COURSE SYLLABUS (Cont.)

Conformance to Guidelines:

"All Applied Academics courses will be taught in the context of real world settings including the workplace, home, and community."

The Applied Mathematics II course will be taught using applied problems from the workplace. Students will be required to solve electronics, motion, force, mixture, work, fluid flow, energy flow, and finance problems that translate into fractional, quadratic, and systems of linear equations. Additionally, students must solve construction and manufacturing design problems that are related to plane and solid geometrical figures as well as trigonometric relationships. Furthermore, students will use the sine function to graph alternating current.

"All Applied Academics courses will emphasize cooperative learning as a primary instruction model."

Since students are expected to learn mathematics both in and out of class, the instructional model of the Applied Mathematics II course will promote cooperative learning in and out of class.

During classroom instruction, the instructor will not use the traditional full session, one-way lecture model where the instructor does most, if not all, of the speaking. Rather, the instructor will use approximately one-third of each session to present mathematical terms, notation, axioms, theorems, algorithms, and applications in the lecture format.

The instructor will use the majority of the classroom instructional time, about two-thirds of each session, to facilitate a group discussion where each student will be encouraged to participate actively and peer learning will result.

Additionally, the instructor will provide daily learning activities out of class. The instructor will explain the benefits of cooperative learning. Students will be encouraged to work in groups to complete the daily assignments.

Finally, to promote an overall learning climate based on cooperation rather than competition, in and out of class, the instructor will use a criterion-referenced evaluation procedure. This procedure emphasizes mastery of course competencies, instead of norm-referenced evaluation procedures based on peer competition and the curve.

COURSE SYLLABUS (Cont.)

"All Applied Academics courses will stress the use of principles, laws, formulas and rules in the real world as opposed to focusing on proofs of principles and laws, the derivation of formulas, or the evolution of rules."

The Applied Mathematics II course will use principles, laws, formulas, and rules to solve technical problems. For example, rather than require students to prove or derive the Pythagorean theorem, quadratic formula, or the law of sines, students will be required to use (apply) them to solve technical problems.

All Applied Academics courses will be competency-based.

The Applied Mathematics II course is based on twenty-four (24) competencies. Each competency states what the student must do to demonstrate the acquisition of knowledge, skills, or attitudes. The attached weekly schedule reflects the approximate week in which the successful student will acquire course competencies.

Submitted by: _____ **Date:** _____

Approved by: _____ **Date:** _____

WEEKLY SCHEDULE - MAT 112

Week 1

1. Use a hand-held scientific calculator to compute numerical solutions to MAT 112 problems.
2. Convert among binary, octal, decimal, and hexadecimal numbers.

Week 2

3. Define and evaluate the six trigonometric functions of any angle.
4. Find the appropriate angle(s) (0 through 360 degrees) when the trigonometric value is known.
5. Find the unknown sides and/or angles of oblique triangles using the law of sines and law of cosines, as appropriate.

Week 3

6. Solve problems that involve the perimeter (or circumference) and area of plane geometrical figures (such as triangles, squares, rectangles, parallelograms, trapezoids, and circles).
7. Solve problems that involve the surface area and volume of solid geometrical figures (such as cubes, rectangular solids, cylinders, cones, pyramids, and spheres).
8. Convert among degrees, radians, and revolutions.
9. Find the amplitude, period, and phase shift for sine and cosine functions.
10. Graph the sine, cosine, and tangent functions.

Week 4

11. Graph alternating current using the sine function.
12. Compute the area of a circle's sector and segment.
13. Compute the arc length, radius, or central angle when two of the other quantities are known.
14. Factor completely multinomials, including difference of two squares and trinomials.

Week 5

15. Reduce algebraic fractions to lowest terms.
16. Add, subtract, multiply, and divide algebraic fractions.

Week 6

17. Solve fractional (rational) equations.

Week 7

18. Solve verbal problems that translate into fractional equations, such as rate problems involving motion, work, fluid flow, energy flow, electronics, and finance problems.

Week 8

19. Solve systems of linear equations in two unknowns using the following methods:
    a. addition method
    b. substitution method
    c. graphical method
    d. determinant method (Cramer's Rule)

Week 9

20. Solve systems of linear equations in three unknowns using determinants.
21. Solve verbal problems (including electronics, construction and manufacturing design, motion, force, mixture, work, fluid flow, and energy flow problems) that translate into linear equations and systems of linear equations.

Week 10 & 11

22. Solve quadratic equations by factoring.
23. Solve quadratic equations using the quadratic formula.
24. Solve verbal problems that translate into quadratic equations, such as motion, manufacturing and construction design, electronics, work, and force problems.

COURSE OUTLINE

DEPARTMENT:	Technical Education Division
CURRICULUM:	Mathematics
COURSE TITLE:	Applied Mathematics III
COURSE NUMBER:	MAT 113
COLLEGE TRANSFER:	No
TYPE OF COURSE:	Allied Supporting & Vocational General Education
CREDIT HOURS:	5

HOURS:

Lecture Hours	53
Lab Hours	00
Homework Hours	53
Other Hours	
Total Hours	106

CLASS SIZE:	35
COURSE DESCRIPTION:	Continuation of MAT 112; includes radical equations, exponential and logarithmic equations, geometry, analytic geometry, inequalities, resolution of vectors, vector analysis, complex numbers, polar coordinates, special topics,calculator fundamentals, and applications.
COURSE HISTORY:	Originally developed by Don Howard, in 1991.
PREREQUISITES:	MAT 112 or instructor's permission.

Course Outline (Cont'd)

LEARNING OBJECTIVES:	HOURS OF INSTRUCTION
A. CITIZENSHIP KNOW-HOW:	
1. RIGHTS AND RESPONSIBILITIES	___
2. CRITICAL THINKING	
(SEE FOUNDATION SKILLS: b. Thinking Skills)	___
3. WORKPLACE ETHICS	___
4. APPLIED ESTHETICS	___
5. LIFECYCLES	___
B. WORKPLACE KNOW-HOW:	
1. FIVE WORKPLACE COMPETENCIES	
a. Resources:	
1) Time	X
2) Money	___
3) Material and Facilities	___
4) Human Resources	___
b. Interpersonal:	
1) Participates as Member of a Team	X
2) Teaches Others New Skills	___
3) Serves Clients/Customers	___
4) Exercises Leadership	___
5) Negotiates	___
6) Works with Diversity	X
c. Uses Information:	
1) Acquires and Evaluates Information	X
2) Organizes and Maintains Information	X
3) Interprets and Communicates Information	X
4) Uses Computers to Process Information	X
d. Systems:	
1) Understands Systems	___
2) Monitors and Corrects Performance	___
3) Improves or Designs Systems	___

Course Outline (Cont'd)

e. Technology:

1) Selects Technology	X
2) Applies Technology to Task	X
3) Maintains and Troubleshoots Equipment	___

2. THREE FOUNDATION SKILLS

a. Basic Skills:

1) Reading	X
2) Writing	X
3) Arithmetic/Mathematics	106
4) Listening	X
5) Speaking	X

b. Thinking Skills:

1) Creative Thinking	___
2) Decision Making	X
3) Problem Solving	X
4) Seeing Things in the Mind's Eye	___
5) Knowing How to Learn	X
6) Reasoning	X

c. Personal Qualities:

1) Responsibility	X
2) Self-Esteem	X
3) Sociability	X
4) Self-Management	X
5) Integrity/Honesty	X

C. MATHEMATICS COMPETENCIES:

ALGEBRA

1. Use the laws of exponents to simplify expressions that have integral or fractional exponents.
2. Convert radical expressions to exponential expressions, and vice versa.
3. Convert exponential expressions to logarithmic expressions, and vice versa.
4. Evaluate logarithms and antilogarithms.
5. Evaluate, manipulate, and simplify logarithmic expressions.
6. Solve exponential and logarithmic equations.
7. Solve exponential growth and decay problems using formulas.
8. Solve verbal problems that translate into exponential or logarithmic equations.
9. Sketch graphs on logarithmic and semilogarithmic paper.
10. Solve radical equations.
11. Solve equations graphically.
12. Solve inequalities algebraically and graphically.

Course Outline (Cont'd)

13. Simplify radicals with negative radicands.
14. Graph complex numbers.
15. Add, subtract, multiply, and divide complex numbers.
16. Convert rectangular coordinates into polar form, and vice versa.
17. Plot points using the polar coordinate system.
18. Apply complex numbers to ac circuits.

GEOMETRY

19. Compute the angular velocity of a rotating body.
20. Compute the linear velocity of a point on a rotating body.
21. Solve verbal problems involving uniform circular motion (rotation)

ANALYTIC GEOMETRY

22. Calculate the distance between two points.
23. Calculate the midpoint between two points.
24. Determine the slope of a line given two points on the line.
25. Find the slope of a line given its angle of inclination, and vice versa.
26. Determine the slope of a line parallel to a given line.
27. Determine the slope of a line perpendicular to a given line.
28. Calculate the angle between two lines.
29. Write the equation of a line using the slope-intercept form or the point-slope form.
30. Write the equation of a circle, parabola, or ellipse using relevant information.
31. Sketch the graph of a line, circle, parabola, or ellipse using its equation.

TRIGONOMETRY

32. Determine the resultant of two or more vectors.
33. Resolve a vector into its components.
34. Solve verbal problems that translate into vectors, such as electronics, displacement, velocity, force, inclined plane, and tension in cable problems.

SPECIAL TOPICS

35. Solve problems that involve special applied mathematics topics based on needs, interests, and abilities of students.

SCIENTIFIC CALCULATOR

36. Use a hand-held scientific calculator to compute numerical solutions to MAT 113 problems. (Additionally, instruction will be presented on the use of a hand-held programmable scientific calculator with graphing capabilities.)

Submitted by: _____ Date: _____

Approved by: _____ Date: _____

COURSE SYLLYBUS

Quarter:	Spring 1993
Course Number:	MAT 113
Course Title:	Applied Mathematics III
Section Number:	01
Instructor:	Don Howard
Office Location:	RS 048
Office Hours:	Arrange (9:00 a.m. to 4:00 p.m.)
Office Phone Number:	764-5376
Room Number:	RS 080
Course Description:	Continuation of MAT 112; includes radical equations, exponential and logarithmic equations, geometry, analytic geometry, inequalities, resolution of vectors, vector analysis, complex numbers, polar coordinates, special topics, calculator fundamentals, and applications.
Required Materials:	Technical Mathematics Second Edition Paul Calter "How to Study Technical Mathematics" Paul Dudenhefer Scientific calculator, compass, protractor, straight edge, and graph paper
Optional Materials:	Student Solution Manual John Knox Student Problem Manual Michael Calter

COURSE SYLLABUS (Cont.)

Optional Materials:

"IBM Software Tools: Computer Aid to Technical Mathematics with Calculus"
Albert Parish, Jr. and Nathan Niles

Video to accompany Technical Mathematics
Paul Calter

CORD's Applied Mathematics
Curriculum Materials

Course Schedule:

See Weekly Schedule below

Evaluation Policy:

You will be evaluated on an applied mathematics project and your three highest examinations. To receive credit for the project, it must be submitted no later than 8:00 a.m., June 00, 1993. Late projects cannot be submitted. The dates on which examinations will be given are as follows:

Examination 1	April 00
Examination 2	May 00
Examination 3	June 00
Final Examination	June 00

If you are absent on an examination date, you will not be permitted to makeup the examination without written correspondence from a licensed health care professional.

Grading Procedure:

Twenty-five percent (25%) of the grade will be based on the applied mathematics project, and twenty-five percent (25%) will be based on each of the three highest examinations.

COURSE SYLLABUS (Cont.)

Conformance to Standards:

"All Applied Academics courses will be taught in the context of real world settings including the workplace, home, and community."

The Applied Mathematics III course will be taught using applied problems from the workplace. Students will be required to solve technical problems that translate into radical, exponential, and logarithmic equations. Additionally, students must solve construction and manufacturing design problems that are related to analytic geometrical figures. Furthermore, students will solve problems that translate into vectors and trigonometric relationships, such as electronics, displacement, velocity, force, inclined plane, and tension in cable problems. Finally, students will be required to present and interpret technical data using regular, polar, logarithmic, and semilogarithmic graph paper.

"All Applied Academics courses will emphasize cooperative learning as a primary instruction model."

Since students are expected to learn mathematics both in and out of class, the instructional model of the Applied Mathematics III course will promote cooperative learning in and out of class.

During classroom instruction, the instructor will not use the traditional full session, one-way lecture model where the instructor does most, if not all, of the speaking. Rather, the instructor will use approximately one-third of each session to present mathematical terms, notation, axioms, theorems, algorithms, and applications in the lecture format.

The instructor will use the majority of the classroom instructional time, about two-thirds of each session, to facilitate a group discussion where each student will be encouraged to participate actively and peer learning will result.

Additionally, the instructor will provide daily learning activities out of class. The instructor will explain the benefits of cooperative learning. Students will be encouraged to work in groups to complete the daily assignments.

Finally, to promote an overall learning climate, in and out of class, based on cooperation, rather than competition, the instructor will use a criterion-referenced evaluation procedure. This procedure emphasizes mastery of course competencies, instead of norm-referenced evaluation procedures based on peer competition and the curve.

COURSE SYLLABUS (Cont.)

"All Applied Academics courses will stress the use of principles, laws, formulas and rules in the real world as opposed to focusing on proofs of principles and laws, the derivation of formulas, or the evolution of rules."

The Applied Mathematics III course will use principles, laws, formulas, and rules to solve technical problems. For example, rather than require students to prove or derive the Pythagorean theorem, quadratic formula, or the law of sines, students will be required to use (apply) them to solve technical problems.

All Applied Academics courses will be competency-based.

The Applied Mathematics III course is based on thirty-six (36) competencies. Each competency states what the student must do to demonstrate the acquisition of knowledge, skills, or attitudes. The attached weekly schedule reflects the approximate week in which the successful student will acquire course competencies.

Submitted by: _____ **Date:** _____

Approved by: _____ **Date:** _____

WEEKLY SCHEDULE - MAT 113

Week 1

1. Use a hand-held scientific calculator to compute numerical solutions to MAT 113 problems.
2. Use the laws of exponents to simplify expressions that have integral or fractional exponents.
3. Convert radical expressions to exponential expressions, and vice versa.
4. Solve radical equations.

Week 2

5. Convert exponential expressions to logarithmic expressions, and vice versa.
6. Evaluate logarithms and antilogarithms.
7. Evaluate, manipulate, and simplify logarithmic expressions.

Week 3

8. Solve exponential and logarithmic equations.
9. Solve exponential growth and decay problems using formulas.
10. Solve verbal problems that translate into exponential or logarithmic equations.
11. Sketch graphs on logarithmic and semilogarithmic paper.

Week 4

12. Calculate the distance between two points.
13. Calculate the midpoint between two points.
14. Determine the slope of a line given two points on the line.
15. Find the slope of a line given its angle of inclination, and vice versa.
16. Determine the slope of a line parallel to a given line.
17. Determine the slope of a line perpendicular to a given line.
18. Calculate the angle between two lines.
19. Write the equation of a line using the slope-intercept form or the point-slope form.

Week 5

20. Write the equation of a circle, parabola, of ellipse using relevant information.
21. Sketch the graph of a line, circle, parabola, or ellipse using its equation.

Week 6

22. Solve equations graphically.
23. Solve inequalities algebraically and graphically.

Week 7

24. Determine the resultant of two or more vectors.
25. Resolve a vector into its components.
26. Solve verbal problems that translate into vectors, such as electronics, displacement, velocity, force, inclined plane, and tension in cable problems.

Week 8

27. Compute the angular velocity of a rotating body.
28. Compute the linear velocity of a point on a rotating body.
29. Solve verbal problems involving uniform circular motion (rotation).

Week 9

30. Simplify radicals with negative radicands.
31. Graph complex numbers.
32. Add, subtract, multiply, and divide complex numbers.
33. Convert rectangular coordinates into polar form, and vice versa.
34. Plot points using the polar coordinate system.

Week 10 & 11

35. Apply complex numbers to ac circuits.
36. Solve problems that involve special applied mathematics topics based on needs, interests, and abilities of students.